WHAT IS CLAIMED IS:

1. A gas sensor abnormality detecting device made to detect the presence or absence of abnormality of a gas sensor having a cell in which a pair of electrodes are formed on a solid electrolyte material to output a signal corresponding to a composition of a measured gas on surfaces of said electrodes through a signal line connected to said electrodes, said device comprising:

signal inputting means for temporarily inputting a test signal including an alternating-current component through said signal line to said cell undergoing abnormality detection;

response signal detecting means for detecting a response signal developing in said signal line in response to the inputting of said test signal; and

decision means for comparing a detection value of said response signal with a prescribed value and, if said detection value resides in one of regions defined by said prescribed value, making a decision that a disconnection abnormality occurs in said cell undergoing the abnormality detection.

2. The device according to claim 1, wherein, for the detection of said response signal, a predetermined time delay is set with respect to said test signal.

3. A gas sensor abnormality detecting device made to detect the presence or absence of abnormality of a gas sensor composed of a plurality of cells each having a pair of electrodes formed on a solid electrolyte material to output a gas detection signal corresponding to a composition of a measured gas at surfaces of said electrodes through a signal line connected to the electrodes and made such that one electrodes of said pairs of electrodes of said plurality of cells are placed to confront a common chamber, said device comprising:

test signal inputting means for temporarily inputting a test signal including an alternating-current component through the signal lines to a specified cell of said plurality of cells;

response signal detecting means for, in response to the inputting of said test signal, detecting a response signal developing in said signal line for a cell, undergoing abnormality detection, other than said specified cell; and

decision means for comparing a detection value of said response signal with a prescribed value and, if said detection value resides in preset one of regions defined by said prescribed value, making a decision that a disconnection abnormality occurs in said cell undergoing the abnormality detection.

4. The device according to claim 3, further comprising second response signal detecting means for, in response to said test signal with respect to said specified cell, detecting a response signal developing in a signal line for said specified cell; and

second decision means for comparing a detection value of said response signal with a prescribed value to, if the detection value resides in preset one of the regions defined by said prescribed value, make a decision that a disconnection abnormality occurs in said specified cell.

5. The device according to claim 4, further comprising:

response signal detecting means for, in response to the inputting of said test signal to said specified cell, detecting a response signal developing in a signal line for the specified cell;

impedance calculating means for obtaining an impedance between said electrodes of said specified cell on the basis of said test signal and said response signal; and

heater control means for controlling a heater integrated with gas sensor together with the cell on the basis of the obtained impedance.

6. The device according to claim 1, further comprising:

temperature state detecting means for detecting a temperature state of said solid electrolyte material; and

inhibiting means for inhibiting the abnormality decision processing in said decision means until said temperature state reaches a predetermined temperature region of said solid electrolyte material.

7. The device according to claim 6, wherein said temperature state detecting means obtains an impedance between said electrodes on the basis of said test signal and said response signal, with said impedance being used as a parameter for said temperature state.

8. The device according to claim 1, wherein said test signal inputting means inputs a temporary voltage variation as said test signal to said signal line, and said response signal detecting means detects a variation of a current flowing through said signal line as said response signal, and said decision means sets, as said one region, a smaller region than said prescribed value and, when said detection value falls below said prescribed value, makes a decision that a disconnection abnormality occurs in said cell undergoing the abnormality detection.

9. The device according to claim 1, wherein said test signal inputting means inputs a temporary current variation as said test signal to said signal line, and said response signal detecting means detects a variation of a voltage in said signal line as said response signal, and said decision means sets, as the one region, a larger region than said prescribed value and, when said detection value exceeds said prescribed value, makes a decision that a disconnection abnormality occurs in said cell undergoing the abnormality detection.

10. A gas sensor abnormality detecting device made to detect the presence or absence of abnormality of a gas sensor composed of a cell having a pair of

electrodes formed on a solid electrolyte material to output a gas detection signal corresponding to a composition of a measured gas on surfaces of said electrodes through a signal line connected to said electrodes, said device comprising:

test signal inputting means for temporarily inputting a test signal including an alternating-current component through said signal line with respect to a cell undergoing abnormality detection;

response signal detecting means for, in response to the inputting of said test signal, detecting a response signal developing in said signal line;

impedance calculating means for obtaining an impedance between said electrodes on the basis of said test signal and said response signal; and

decision means for comparing the obtained impedance value with a prescribed value and, if the obtained impedance value exceeds said prescribed value, making a decision that a disconnection abnormality occurs in said undergoing abnormality detection.

11. The device according to claim 10, further comprising:

temperature state detecting means for detecting a temperature state of said solid electrolyte material; and

inhibiting means for inhibiting the abnormality decision processing in said decision means until said temperature state reaches a predetermined temperature region of said solid electrolyte material.

12. The device according to claim 11, wherein said temperature state detecting means obtains an energizing time with respect to a heater integrated with said gas sensor together with said cell, with said energizing time being used as a parameter for said temperature state.

13. The device according to claim 11, wherein said temperature state detecting means obtains a total applied electric energy to a heater integrated with said gas

sensor together with said cell, with said total applied electric energy being used as a parameter for said temperature state.

14. The device according to claim 1, wherein said test signal inputting means constitutes a power supply of said cell and temporarily inputs one of a voltage variation and a current variation to said signal line, and said response signal detecting means detects one of a variation of a current flowing through said signal line and a variation of a voltage between said electrodes as said response signal.

15. The device according to claim 14, wherein said test signal inputting means inputs one of a voltage and a current varying in both a positive and negative directions with respect to one of a voltage and a current immediately before.

16. The device according to claim 14, wherein said test signal inputting means inputs one of a voltage and a current varying in one of a positive and negative directions with respect to one of a voltage and a current immediately before.